

# REPORT DOCUMENTATION PAGE

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12a. DISTRIBUTION/AVAILABILITY STATEMENT

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13. ABSTRACT (Maximum 200 words)

The 12th International Conference on Ion Beam Analysis was held at Arizona State University, Tempe, AZ from 22-26 May 1995. There were 225 conference participants. The conference sessions included: Nuclear Resonance and Reaction Analysis; Ion Beam Characterization of New Materials; Particle-Induced X-ray Emission; Microbeams; Elastic Recoil Detection Analysis; Surfaces and Interfaces; Synthesis and Processing; Time of Flight and High Energy Resolution; Stopping Power and Energy Loss, and Multiple Scattering; RBS, Channeling and other IBA Techniques; Panel on Applications for *In situ* Process Monitoring; and Workshop on Electronic Databases for Ion Beam Analysis.

Of particular note was the Panel on Applications for *In situ* Process Monitoring chaired by R. Reeber of the Army Research Office. The main topics covered were the Time of Flight Spectroscopy and the *in situ* MeV ion beam ion beam analysis.

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**Twelfth International Conference on Ion Beam Analysis**  
**22-26 May 1995**  
**Arizona State University, Tempe, AZ 85287-1704**

The International Conference on Ion Beam Analysis was held at Arizona State University in Tempe, Arizona from 22-26 May 1995. There were 225 conference participants including scientists, university professors and graduate students. The sessions, session organizers and chairs are listed below:

**Topic A: Nuclear Resonance and Reaction Techniques**

*Session Organizers:* J.A. Leavitt, L.C. McIntyre Jr. and J.R. Tesmer.

*Invited Speakers:* W.N. Lennard (U.W. Ontario) and G. Vízkelethy (Idaho State U.).

**Topic B: Ion Beam Characterization of New Materials**

*Session Organizers:* J.C. Barbour and M. Nastasi.

*Invited Speakers:* R. Composto (U. Penn), J.-P. Hirvonen (VTT Manufacturing Tech) and J.M. Phillips(AT&T Bell Labs).

**Topic C: Particle-Induced X-ray Emission**

*Session Organizer:* T. Cahill.

*Invited Speakers:* B. Kusko (U.C. Davis) and J. Miranda (U.N.A.M.).

**Topic D: Microbeams**

*Session Organizers:* B. Doyle and S. Lee.

*Invited Speakers:* M. Takai (U. Osaka) and K. Horn (Sandia).

**Topic E: Elastic Recoil Detection Analysis**

*Session Organizers:* B. Doyle and R.B. Gregory.

*Invited Speakers:* J.C. Barbour (Sandia), S. Baumann (Charles Evans, Inc) and W. Assmann (Universitat Munchen).

**Topic F: Surfaces and Interfaces**

*Session Organizers:* K. Kavanagh and I.S.T. Tsong.

*Invited Speakers:* E. Taglauer (Max-Planck-Institut) and P. Varga (T.U. Wien).

**Topic G: Synthesis and Processing**

*Session Organizers:* J.C. Barbour and J.W. Rabalais.

*Invited Speakers:* D. Armour (Salford U.) and Y. Makita (Electrotechnical Laboratory).

**Topic H: Time of Flight and High Energy Resolution**

*Session Organizers:* D.E. Fowler and B.J. Wilkens.

*Invited Speakers:* M. Copel (IBM) and R.A. Weller (Vanderbilt U.).

**Topic I: Stopping Power and Energy Loss, and Multiple Scattering**

*Session Organizer:* W.K. Chu.

*Invited Speakers:* H. Geissel (Gesellschaft f. Schwerionenforsch) and J. Raisanen (U. Helsinki).

**Topic J: Other IBA Techniques**

*Session Organizers:* C. Maggiore and J. Watanabe.

*Invited Speakers:* D. Hickmott (Sandia); C. Magee (Charles Evans East) and C. Neelmeijer (Res. Center Rossendorf).

**Topic K: Panel on Applications for *In situ* Process Monitoring** *Moderator:* R.R. Reeber.

*Invited Speakers:* E. Chason (Sandia National Laboratories), H. Wollnik (Universitat Giessen), J. Albert Schultz (Ionwerks) and Ning Yu (Los Alamos National Laboratory).

**Topic L: Workshop on Electronic Databases for Ion Beam Analysis**

*Session Organizer:* I.C. Vickridge.

**Topic M: Workshop: CUTBA (Cleaning Up the Tower of Babel of Acronyms) in IBA**

*Session Organizer:* G. Amsel.

## ***In-situ* Process Monitoring**

The Ion Beam Applications for *In-situ* Process Monitoring session was organized by Dr. Robert Reeber of the Army Research Office. Seven papers, four of which were invited, described recent *in-situ* monitoring approaches for thin film growth and related advances in solid state detectors and Time of Flight (TOF) Mass Spectrometry. Exciting advances in TOF, phase distribution differentiation in growing films and evolving surface crystallography, were described by Al Schultz of Ionwerks, Inc. in the first invited paper. The inferred surface crystallography is made possible by new large area detectors (Wollnik, et. al. NIM A 335, p.146 (1993)) and software/hardware developments. The methodology has been applied to materials processing of diamond, boron nitride, high quality GaN (at Ionwerks, IBM Yorktown), to ferroelectrics (Allan Kraus et. al. Argonne). Good results were obtained on-line in vacuums of  $10^{-4}$  Torr (typical of CVD growth chambers). H. Wollnik (Physics Institute-Giessen) highlighted recent advances in TOF mass analyzing Detectors that can reach mass resolving powers  $m/\Delta m$  of from 1000 to 2000. With further developments of this technology higher sensitivities and mass resolving powers can be expected. Several other papers (Y et al. Los Alamos, Farley et al. Ibis Corp.,) utilized on-line RBS, for radiation damage characterization of sol gel ceramics and early SIMOX metallic screening. Chason and Mayer at Sandia described their x-ray reflectivity methods for characterizing ultrathin (subnanometer resolution) semiconductor surface roughnesses and layer thicknesses.

After the technical presentations R. Reeber chaired an academic/industry panel that involved Karen Kavanaugh, UC San Diego; Al Schultz, Ionwerks; Ken Purser, IBIS Technology Corp; and James Mayer, Arizona State. The panel discussion began with opening remarks by Reeber. He explained the Army's need in future decades for superstrong and superhard materials which can be produced at low cost. Low friction and low wear materials as well as new methods for characterizing materials and processes were of interest to the Defense Department. Ion beam *in-situ* characterization/processing could give information relating to non-equilibrium processing of such materials that might not be obtained elsewhere. The effects of ion beam energies, crystallinity and characterization of other processing parameters were judged to be important. Any such *in-situ* monitoring development should address specific problems needing solution rather than be techniques looking for a problem to solve. The panel quickly addressed the complexity of such *in-situ* systems and effectively indicated a need to keep them as simple as possible. Applications to structural materials was probably not cost effective except for research information unobtainable from *ex-situ* characterization. High value added products (electronics, biomaterials, etc.) could benefit in the shorter term by recent advances. Specific examples given were Si-Ge-C growth, GaN, optoelectronics, jet engine components where safety/efficiency factors were big cost drivers. In the longer term it was indicated that research on novel materials synthesis and discovery could benefit from improved understanding of bonding, hydrogen interactions etc., when *in-situ* analysis methods were combined with careful process control. Some discussions of successes and failures in the Government Small Business Innovation Program were discussed as well as its general impact as stimulator of commercial equipment development.

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**ARO:**

E. Chason.....	\$500.00
<i>X-Ray Reflectivity Measurement of Sputter-Induced Roughening and Smoothing Kinetics</i>	
Sandia National Laboratories	
P.O. Box 5300, Albuquerque, NM 87185-0350	
W.N. Lennard.....	\$500.00
<i>Surface Science Using MeV Deuteron Beams</i>	
University of Western Ontario	
Department of Physics, London N6A 3K7 CANADA	
Jarrold W. Martin.....	\$250.00
<i>Elemental profiling using heavy ion recoil time-of-flight spectroscopy</i>	
University of N.S.W.	
School of Physics, Sydney 2052 AUSTRALIA	
J. Albert Schultz .....	\$500.00
<i>Time-of-Flight Ion Scattering and Recoil Spectroscopy used for Insitu Monitoring of Surface Composition, Phase and Crystallography During Thin Film Deposition</i>	
Ionwerks	
2472 Bolsover #255, Houston, TX 77005	
Edmund Taglauer.....	\$500.00
<i>Ion Scattering and STM Studies of Stepped Surfaces</i>	
Max-Planck-Institut fur Plasmaphysik	
Boltzmannstr. 2, Garching Munchen D-85748 GERMANY	
Robert A. Weller .....	\$500.00
<i>Time-of-Flight Medium Energy Elastic Recoil and Backscattering Spectrometry</i>	
Vanderbilt University	
Box 1687 Station B, Nashville, TN 37235	
H. Wollnik .....	\$500.00
<i>Time-of-Flight Mass Analyzers for all Samples of gases and vapors</i>	
Universitat Giessen	
2.Phys. Institut, Heinrich-Buff Ring 16, Giessen 35392 GERMANY	
Ning Yu .....	\$110.00
<i>In-situ MeV Ion Beam Analysis of Ceramic Surfaces Modified by Ion Irradiation</i>	
Los Alamos National Laboratory	
Materials Science and Technology Division, Los Alamos, NM 87545	
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